Appendix B - SWMP Activity Data

MS4 Inventory Statistics

Household Chemical Collection Center 10-Year Comparison

State of Missouri Toxics Release Inventory: 2003 Data Appendix C pages 24-28

Industrial Facility Inspection Checklist

Inventory of Known Major Outfalls

Lab Analysis Sheets
Pesticide Data Analysis
Acid/Base Neutral Organic Analysis
Volatile Organic Analysis

A Final Report to the City of Springfield on the Biological Assessment of Urban Streams

STORMWATER INVENTORY 5/26/05 53.5% Complete

POINT FEATURES

WATERSHED	Projected Points Features	5/26/05 Point Features	% Complete
FARMER BRANCH	32	0	0%
FASSNIGHT CREEK	894	808	90%
GALLOWAY CREEK	952	904	95%
HUNT BRANCH	43	0	0%
INMAN CREEK	475	360	76%
JAMES RIVER	544	138	25%
JORDAN CREEK LOWER BRANCH	1283	1180	92%
JORDAN CREEK NORTH BRANCH	523	507	97%
JORDAN CREEK SOUTH BRANCH	1253	424	34%
PEA RIDGE CREEK	599	206	34%
PIERSON CREEK	243	99	41%
RAINER BRANCH	464	0	0%
SOUTH CREEK	730	347	48%
SOUTH DRY SAC	852	22	3%
SPRING BRANCH	238	27	11%
THOMPSON BRANCH	130	51	39%
UPPER WILSONS CREEK	648	247	38%
WARD BRANCH	1151	994	86%
WILSONS CREEK	398	22	6%
Total Features	**11453**	**6336**	

TOTAL % COMPLETE **55%**

LINEAR FEATURES

WATERSHED	Projected Linear Feet	5/26/05 Linear Feet	% Complete
FARMER BRANCH	7290	0	0%
FASSNIGHT CREEK	202076	142864	71%
GALLOWAY CREEK	241432	222117	92%
HUNT BRANCH	9636	0	0%
INMAN CREEK	107466	81994	76%
JAMES RIVER	122927	48612	40%
JORDAN CREEK LOWER BRANCH	174926	160932	92%
JORDAN CREEK NORTH BRANCH	170613	165495	97%
JORDAN CREEK SOUTH BRANCH	283389	80696	28%
PEA RIDGE CREEK	135512	40573	30%
PIERSON CREEK	54892	18213	33%
RAINER BRANCH	104969	0	0%
SOUTH CREEK	165025	83640	51%
SOUTH DRY SAC	192722	7233	4%
SPRING BRANCH	53839	8596	16%
THOMPSON BRANCH	38984	34600	89%
UPPER WILSONS CREEK	146606	48504	33%
WARD BRANCH	260119	178022	68%
WILSONS CREEK	90046	5207	6%
Total Feet	**2562469**	**1327298**	
Total Miles	**485**	**251**	

TOTAL % COMPLETE **52%**

CITY of SPRINGFIELD

Household Chemical Collection Center

Ten Year Comparison

	7/13/95-7/11/96	7/12/96-7/12/97	7/13/97-6/30/98	7/1/98-6/30/99	7/1/99-6/30/00	7/1/00-6/30/01	7/1/01-6/30/02	7/1/02-6/30/03	7/1/03-6/30/04	7/1/04 6/30/05	10 year Totals	10 Year Average
Appointments	**2,567**	**2,442**	**2,286**	**2,933**	**2,714**	**2,998**	**3,380**	**2,975**	**3,014**	**3,206**	**28,515**	**2,852**
Lab Pack Materials Disposed of in lbs	**11,463**	**13,014**	**10,021**	**18,470**	**14,714**	**13,082**	**17,220**	**19,130**	**16,760**	**17,286**	**151,160**	**15,116**
Latex Paint	24,454	21,764	20,308	28,556	28,600	24,750	29,150	35,200	31,350	31,350	275,482	27,548
Oil Base Paint	11,600	11,001	10,627	11,786	11,352	10,817	11,326	13,384	13,900	20,592	126,385	12,639
Fuels	3,617	2,748	4,212	4,428	3,586	2,872	3,156	3,473	4,420	7,261	39,773	3,977
Batteries	2,184	2,501	3,869	2,465	1,797	1,533	1,100	1,100	1,925	650	19,124	1,912
Fluorescent Tubes							165	165	165	270	765	77
Tin	11,524	7,600	5,000	3,840	3,664	3,268	3,713	0	0	0	38,609	3,861
Cardboard	7,800	1,200	1,000	1,280	1,400	1,975	2,450	4,550	2,411	2,565	26,631	2,663
Car Batteries	4,160	3,840	4,160	3,640	3,115	2,625	2,660	3,010	4,270	2,975	34,455	3,446
Oil Filters	148	0	0	0	0	0	0	0	0	0	148	
Antifreeze	1,960	1,460	2,430	2,280	2,922	2,127	3,080	3,465	3,001	4,180	26,905	2,691
Waste Oil	9,620	11,130	9,550	10,370	9,660	10,318	6,750	9,280	10,557	8,100	95,335	9,533
Misc. Materials Ex.	3,451	2,977	2,530	6,099	4,629	5,207	8,500	6,321	4,427	7,304	51,445	5,144
Total Pounds Recycled	**80,518**	**66,221**	**63,686**	**74,744**	**70,725**	**65,492**	**72,050**	**79,948**	**76,426**	**85,247**	**735,057**	**73,506**
Total Disposed of/Recycled	**91,981**	**79,235**	**73,707**	**93,214**	**85,439**	**78,574**	**89,270**	**99,078**	**93,186**	**102,533**	**886,217**	**88,622**
% Recycled	88%	84%	86%	80%	83%	83%	81%	81%	82%	83%	83%	83%

City Of Springfield
Public Works Department
Solid Waste Management Division
PO Box 8368
Springfield, MO. 65801
417-864-1905
Recycling Hotline: 417-864-1904
www.springfieldmogov.org/recycling

Avg. lbs.of material recycled per appointment	**25.78**
Avg. lbs.of material disposed of per appointment	**5.3**
% Recycled in 10 years	**83%**
10 year total appointments	**28,515**
10 year total in pounds	**886,217**

Printed on recycled paper

COUNTY / FACILITY / CHEMICAL	CITY	On- and Off-site Releases AIR	LAND	WATER	POTW	DISP	On- and Off-site Waste Mgmt RECYCLE	ENERGY	TRMT
TRICHLOROETHYLENE		14,400.0	0.0	0.0	0.0	0.0	500,000.0	0.0	5,500.0
SPORLAN VALVE CO. - PLANT#1	**WASHINGTON**								
COPPER		0.0	0.0	0.0	6.0	3,400.0	0.0	0.0	0.0
LEAD		0.0	0.0	0.0	0.0	68.0	0.0	0.0	0.0
TRICHLOROETHYLENE		9,800.0	0.0	0.0	0.0	0.0	540,000.0	0.0	1,400.0
SPORLAN VALVE CO. - PLANT#3	**WASHINGTON**								
COPPER		0.0	0.0	0.0	2.0	10,067.0	0.0	0.0	0.0
LEAD		0.0	0.0	0.0	0.0	200.0	0.0	0.0	0.0
NITRIC ACID		5.0	0.0	0.0	0.0	0.0	0.0	0.0	14,000.0
TRICHLOROETHYLENE		10,400.0	0.0	0.0	0.0	0.0	7,300,000.0	0.0	11,000.0
ST. CLAIR DIE CASTING LLC	**ST. CLAIR**								
COPPER		0.0	0.0	0.0	0.0	0.0	1,382.0	0.0	0.0
LEAD		0.0	0.0	0.0	0.0	0.0	144.0	0.0	0.0
NICKEL		0.0	0.0	0.0	0.0	0.0	829.0	0.0	0.0
TRADCO, INC.	**WASHINGTON**								
HYDROGEN FLUORIDE		358.0	0.0	0.0	0.0	0.0	0.0	0.0	75,800.0
NITRATE COMPOUNDS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	32,000.0
NITRIC ACID		240.0	0.0	0.0	0.0	0.0	0.0	0.0	32,500.0
TRUE MFG. CO., INC.	**PACIFIC**								
CHLORODIFLUOROMETHANE		8,409.0	0.0	0.0	0.0	750.0	0.0	0.0	0.0
DIISOCYANATES		2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREENE									
3M CO. - SPRINGFIELD	**SPRINGFIELD**								
BUTYL ACRYLATE		10.0	0.0	0.0	0.0	0.0	0.0	0.0	1,350.0
CERTAIN GLYCOL ETHERS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	680.0
CYCLOHEXANE		7,540.0	0.0	0.0	0.0	0.0	0.0	0.0	4,920.0
DIISOCYANATES		180.0	0.0	0.0	0.0	0.0	0.0	0.0	69,440.0
METHANOL		710.0	0.0	0.0	0.0	0.0	0.0	0.0	11,890.0
METHYL ETHYL KETONE		32,020.0	0.0	0.0	0.0	0.0	0.0	0.0	554,060.0
METHYL ISOBUTYL KETONE		5,150.0	0.0	0.0	0.0	0.0	0.0	0.0	28,950.0
N-HEXANE		7,740.0	0.0	0.0	0.0	0.0	6,150.0	0.0	14,860.0
TETRABROMOBISPHENOL A		16.0	0.0	0.0	0.0	0.0	0.0	0.0	504.0

COUNTY	FACILITY	CITY	CHEMICAL	On- and Off-site Releases AIR	LAND	WATER	POTW	DISP	On- and Off-site Waste Mgmt RECYCLE	ENERGY	TRMT
			TOLUENE	57,390.0	0.0	0.0	0.0	0.0	169,430.0	0.0	2,038,010.0
			TOLUENE DIISOCYANATE (MIXED ISOMERS)	70.0	0.0	0.0	0.0	0.0	0.0	0.0	27,200.0
			XYLENE (MIXED ISOMERS)	430.0	0.0	0.0	0.0	0.0	0.0	0.0	2,480.0
			ZINC COMPOUNDS	7,320.0	0.0	0.0	0.0	9,100.0	0.0	0.0	0.0
	ACME STRUCTURAL, INC.						**SPRINGFIELD**				
			CHROMIUM COMPOUNDS	5.0	0.0	5.0	0.0	0.0	7,238.0	0.0	0.0
			MANGANESE COMPOUNDS	250.0	0.0	250.0	0.0	0.0	5,507.0	0.0	0.0
			NICKEL COMPOUNDS	5.0	0.0	5.0	0.0	0.0	4,504.0	0.0	0.0
	ADM ALLIANCE NUTRION, INC.						**SPRINGFIELD**				
			ZINC COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CARLISLE POWER TRANSMISSION PRODUCTS, INC.						**SPRINGFIELD**				
			BENZO(G,H,I)PERYLENE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	240.0
			DIISOCYANATES	2,505.0	0.0	0.0	0.0	80.0	0.0	0.0	1,590.0
			POLYCYCLIC AROMATIC COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22,000.0
			TOLUENE	12,900.0	800.0	0.0	0.0	800.0	0.0	564,200.0	0.0
			ZINC COMPOUNDS	3.0	0.0	0.0	20.0	55,050.0	120.0	0.0	0.0
	CLARIANT LSM (MISSOURI) INC.						**SPRINGFIELD**				
			BROMINE	3,278.0	0.0	0.0	0.0	0.0	0.0	0.0	2,098,768.0
			CHLOROFORM	6,860.0	0.0	0.0	0.0	0.0	0.0	66,721.0	19,773.0
			CHLOROMETHANE	8,322.0	0.0	0.0	0.0	0.0	0.0	0.0	149,183.0
			CYANIDE COMPOUNDS	21.0	0.0	0.0	0.0	0.0	26.0	383.0	40,324.0
			DICHLOROMETHANE	24,427.0	0.0	0.0	0.0	0.0	0.0	13,584.0	903,476.0
			DIOXIN AND DIOXIN-LIKE COMPOUNDS	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2
			HYDROCHLORIC ACID ("AEROSOLS" ONLY)	2,252.0	0.0	0.0	0.0	0.0	0.0	0.0	1,083,447.0
			METHANOL	1,508.0	0.0	0.0	0.0	0.0	0.0	18,943.0	9,423.0
			N-HEXANE	2,626.0	0.0	0.0	0.0	0.0	14,960.0	219,028.0	31,501.0
			SULFURIC ACID ("AEROSOLS" ONLY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	148,349.0
			TOLUENE	10,004.0	0.0	0.0	0.0	0.0	50,320.0	736,729.0	246,860.0
	CONCRETE CO. OF SPRINGFIELD						**REPUBLIC**				
			LEAD COMPOUNDS	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			LEAD COMPOUNDS	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			MERCURY COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			MERCURY COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

COUNTY	FACILITY	CITY	CHEMICAL	On- and Off-site Releases AIR	LAND	WATER	POTW	DISP	On- and Off-site Waste Mgmt RECYCLE	ENERGY	TRMT
DAIRY FARMERS OF AMERICA, INC.							**SPRINGFIELD**				
			NITRATE COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,299.0
			NITRIC ACID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,607.0
GE CONSUMER AND INDUSTRIAL							**SPRINGFIELD**				
			CHROMIUM	0.5	0.0	0.0	0.0	0.6	25,316.0	0.0	0.0
			COPPER	267.7	0.0	0.0	2.0	3,468.0	117,545.0	0.0	0.0
			LEAD	6.7	0.0	0.0	1.0	31.0	1,711.0	0.0	0.0
			MANGANESE	36.0	0.0	0.0	12.0	245.0	319,624.0	0.0	0.0
			NICKEL	33.2	0.0	0.0	1.0	146.0	48,844.0	0.0	0.0
			ZINC COMPOUNDS	0.0	0.0	0.0	50.0	343.0	0.0	0.0	0.0
HILAND DAIRY FOODS CO.							**SPRINGFIELD**				
			NITRIC ACID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10,230.0
INTERCONNECT TECHNOLOGIES DIV-LITTON SYSTEMS, INC.							**SPRINGFIELD**				
			COPPER COMPOUNDS	0.0	0.0	0.0	250.0	0.0	35,287.0	0.0	0.0
			LEAD COMPOUNDS	4.0	0.0	2.9	64.0	0.0	10,866.0	0.0	0.0
			NITRIC ACID	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAMES RIVER POWER STATION							**SPRINGFIELD**				
			BARIUM COMPOUNDS	596.0	26,342.0	2,773.0	0.0	0.0	0.0	0.0	0.0
			DIOXIN AND DIOXIN-LIKE COMPOUNDS	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			HYDROCHLORIC ACID ("AEROSOLS" ONLY)	101,436.0	0.0	0.0	0.0	0.0	0.0	0.0	409,969.0
			HYDROGEN FLUORIDE	68,196.0	0.0	0.0	0.0	0.0	0.0	0.0	65,273.0
			LEAD COMPOUNDS	60.0	817.0	27.0	0.0	0.0	0.0	0.0	0.0
			MERCURY COMPOUNDS	74.0	9.0	1.0	0.0	0.0	0.0	0.0	0.0
			SULFURIC ACID ("AEROSOLS" ONLY)	21,475.0	0.0	0.0	0.0	0.0	0.0	0.0	7,158.0
KERR MCGEE CHEMICA,L LLC							**SPRINGFIELD**				
			POLYCYCLIC AROMATIC COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	500.0	0.0
KERR MCGEE CHEMICAL, LLC							**SPRINGFIELD**				
			CREOSOTE	3,200.0	0.0	0.0	0.0	0.0	370,000.0	4,800.0	0.0
KO MANUFACTURING, INC.							**SPRINGFIELD**				
			CERTAIN GLYCOL ETHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			HYDROGEN FLUORIDE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KRAFT FOODS GLOBAL, INC.							**SPRINGFIELD**				

COUNTY	FACILITY	CITY	CHEMICAL	On- and Off-site Releases AIR	LAND	WATER	POTW	DISP	On- and Off-site Waste Mgmt RECYCLE	ENERGY	TRMT
			NITRATE COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,520.0
			NITRIC ACID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,919.0
	LOREN COOK - DALE ST. PLANT						SPRINGFIELD				
			CHROMIUM	5.0	0.0	11.0	0.2	3.0	22,132.0	0.0	0.0
			COPPER	0.0	0.0	16.0	5.7	4.0	48,480.0	0.0	0.0
			LEAD	0.0	0.0	8.4	0.4	0.0	149.3	0.0	0.0
			MANGANESE	10.0	0.0	29.0	0.0	5.0	66,215.0	0.0	0.0
			NICKEL	2.0	0.0	8.0	0.2	3.0	27,306.0	0.0	0.0
	LOREN COOK COMPNY - BARNES ST. PLANT						SPRINGFIELD				
			CHROMIUM	0.0	0.0	12.0	0.2	5.0	37,838.0	0.0	0.0
			COPPER	0.0	0.0	37.0	1.2	7.0	27,665.0	0.0	0.0
			MANGANESE	22.0	0.0	440.0	0.0	10.0	42,204.0	0.0	0.0
			NICKEL	0.0	0.0	17.0	0.2	6.0	37,249.0	0.0	0.0
	NORTHSTAR BATTERY CO., LLC						SPRINGFIELD				
			LEAD COMPOUNDS	0.0	0.0	0.0	12.8	0.0	1,931,578.0	0.0	0.0
	OZARKS CULTURED MARBLE						SPRINGFIELD				
			STYRENE	11,548.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PAUL MUELLER CO.						SPRINGFIELD				
			ALUMINUM (FUME OR DUST)	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CHROMIUM	500.0	0.0	250.0	250.0	250.0	0.0	0.0	0.0
			COPPER	500.0	0.0	250.0	250.0	250.0	0.0	0.0	0.0
			MANGANESE	500.0	0.0	250.0	250.0	250.0	0.0	0.0	0.0
			NICKEL	500.0	0.0	250.0	250.0	250.0	0.0	0.0	0.0
			SULFURIC ACID ("AEROSOLS" ONLY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			XYLENE (MIXED ISOMERS)	12,650.0	0.0	0.0	0.0	0.0	0.0	11,025.0	5.0
	PURE-FLO PRECISION						SPRINGFIELD				
			CHROMIUM	5.0	5.0	5.0	5.0	817.0	60,173.0	0.0	0.0
			NICKEL	5.0	5.0	5.0	5.0	970.0	43,085.0	0.0	0.0
	RIDEWELL CORP.						SPRINGFIELD				
			TOLUENE	19,401.0	0.0	0.0	0.0	0.0	0.0	2,031.0	0.0
	SAFETY-KLEEN SYSTEMS (619302)						SPRINGFIELD				
			ETHYLENE GLYCOL	4.0	0.0	0.0	0.0	0.0	110,283.0	0.0	0.0

COUNTY	FACILITY	CITY	CHEMICAL	On- and Off-site Releases AIR	LAND	WATER	POTW	DISP	On- and Off-site Waste Mgmt RECYCLE	ENERGY	TRMT
			LEAD	0.0	0.0	0.0	0.0	0.0	1,045.0	0.0	0.0
			POLYCYCLIC AROMATIC COMPOUNDS	0.0	0.0	0.0	0.0	0.0	2,698.0	0.0	0.0
	SOUTHWEST POWER STATION						**BROOKLINE STATION**				
			DIOXIN AND DIOXIN-LIKE COMPOUNDS	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			HYDROCHLORIC ACID ("AEROSOLS" ONLY)	24,336.0	0.0	0.0	0.0	0.0	0.0	0.0	97,345.0
			HYDROGEN FLUORIDE	49,838.0	0.0	0.0	0.0	0.0	0.0	0.0	49,838.0
			LEAD COMPOUNDS	38.0	1,105.0	1.0	0.0	0.0	0.0	0.0	0.0
			MERCURY COMPOUNDS	75.0	30.0	0.1	0.0	0.0	0.0	0.0	0.0
			SULFURIC ACID ("AEROSOLS" ONLY)	3,607.0	0.0	0.0	0.0	0.0	0.0	0.0	1,203.0
	STAINLESS FABRICATION, INC.						**SPRINGFIELD**				
			CHROMIUM COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			MANGANESE COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			NICKEL COMPOUNDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SUPERIOR SOLVENTS & CHEMICALS						**SPRINGFIELD**				
			1,2,4-TRIMETHYLBENZENE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CERTAIN GLYCOL ETHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			DICHLOROMETHANE	1,563.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0
			METHANOL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			METHYL ETHYL KETONE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			N-BUTYL ALCOHOL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			STYRENE	250.0	0.0	0.0	0.0	250.0	0.0	1,550.0	0.0
			TETRACHLOROETHYLENE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			TOLUENE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			TRICHLOROETHYLENE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			XYLENE (MIXED ISOMERS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	UNIVAR USA INC.						**SPRINGFIELD**				
			NITRIC ACID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	WEBCO, INC.						**SPRINGFIELD**				
			CHROMIUM	253.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			MANGANESE	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			NICKEL	250.0	0.0	0.0	0.0	0.0	7,425.0	0.0	0.0
			TOLUENE	8,673.0	0.0	0.0	0.0	0.0	5,000.0	0.0	0.0

Industrial Facility Inspection Checklist

CITY of SPRINGFIELD

Facility Name:
Facility Address:
Facility Representative:
NPDES Permit #:
SARA Tile III (EPCRA) Section 313 Reporting Facility: Y ☐ N ☐
City Inspector:
Date of Inspection:

General and Background Information	
Y	N
☐	☐ Vehicle maintenance facility on site?
☐	☐ UST's on site? If so, how many?
☐	☐ AST's on site? If so, how many?
☐	☐ Any reported spills in the last three years? If so, material and quantity spilled and mitigation action taken:
☐	☐ Any NOV's or other enforcement actions by City, MDNR, or EPA in the past three years? If so, reason for actions:
NPDES Permit requires ☐ SWPPP ☐Discharge monitoring ☐Neither	

Inspection Checklist			
Y	N	N/A	
☐	☐	☐	Vehicle and equipment wash area discharges to ☐ sanitary sewer or ☐ ground onsite w/ no discharge and no known hazardous materials in wash water
☐	☐	☐	Collection facilities provided and arrangements made for proper disposal of ☐petroleum waste ☐solvents, ☐freon/coolants ☐other haz waste ☐ other
☐	☐	☐	Evidence of oil, grease, or other chemicals on the ground
☐	☐	☐	Excessive dust from industrial operations
☐	☐	☐	Leaking equipment, pipes, containers, or lines
☐	☐	☐	Outdoor materials storage areas covered
☐	☐	☐	Outdoor drums covered properly
☐	☐	☐	Containers labeled properly
☐	☐	☐	Waste dumpsters closed and not overflowing
☐	☐	☐	Spill containment and clean-up materials on site and in convenient locations
☐	☐	☐	Erosion in drainage areas or unpaved areas
☐	☐	☐	Good housekeeping – outside areas clean
☐	☐	☐	Unpermitted flow at outfalls (check during dry weather)

List any materials stored outdoors:

Comments:

Recommendations:

KNOWN MAJOR OUTFALLS INVENTORY*

FEATURE TYPE	ADDRESS	LANDUSE
	FASSNIGHT CREEK WATERSHED	
10' X 3.5' BOX CULVERT	1451 S THELMA AV	RESIDENTIAL & COMMERCIAL
54" RCP	MAPLE PARK CEMETARY	RESIDENTIAL & COMMERCIAL
5' X 3.5' BOX CULVERT	FASSNIGHT BOX BETWEEN HOLLAND & KIMBROUGH	RESIDENTIAL
12' X 4' BOX CULVERT	KINGS AND BROOKSIDE (UNDERNEATH KINGS INTO CREEK)	RESIDENTIAL
	GALLOWAY CREEK WATERSHED	
47" X 31" BOX CULVERT	4300 BLK S LONE PINE AVE AT RAGAN CT	RESIDENTIAL
2 @ 36" CMP	3500 BLK S LONE PINE AVE, E SIDE OF RR	RESIDENTIAL
2 @ 42" RCP	W SIDE 3200 BLK S INGRAM MILL RD	COMMERCIAL & RESIDENTIAL
48" RCP	SE CORNER BARATARIA ST & CHANTILLY AVE	RESIDENTIAL
36"RCP	SE CORNER LUSTER AVE & SUNSET ST	RESIDENTIAL
42" CMP	400' S OF 2500 BLK E SUNSHINE ST, W SIDE OF RR	INDUSTRIAL
2 @ 42" CPVC & RCP PIPES	1855 S INGRAM MILL RD	COMMERCIAL
60" RCP	1855 S INGRAM MILL RD	COMMERCIAL
8.5' X 3' BOX CULVERT	SW CORNER 2620 E SUNSHINE ST	RESIDENTIAL & COMMERCIAL
48" CMP	2900 BLK E EASTMOOR DR	COMMERCIAL
2 @ 38" X 60" HECP	3103 E TOPPING CIRCLE	RESIDENTIAL
42" RCP	SE CORNER GLENSTONE AVE & SUNSET ST	RESIDENTIAL & COMMERCIAL
21 X 4 BOX CULVERT	S SIDE SUNSET ST AT BRENTWOOD AVE	RESIDENTIAL
	INMAN CREEK WATERSHED	
3@ 24" x 38" HECP	426 E MONTCLAIR ST	COMMERCIAL, RESIDENTIAL (APTS)
	JORDAN CREEK WATERSHED	
CHANNEL	NE CORNER 1200 BLK W NICHOLS & RR	COMMERCIAL, RESIDENTIAL, INDUSTRIAL
48" RCP	SE CORNER KANSAS EXPY/WALNUT ST	COMMERCIAL & INDUSTRIAL
36" RCP	N SIDE 1900 BLOCK W GRAND	COMMERCIAL
7' X 4' BOX CULVERT	S SIDE 1900 BLOCK W GRAND	COMMERCIAL
5' x 2' BOX CULVERT	E SIDE 900 BLOCK N FRANKLIN	RESIDENTIAL
2@8' X 5' BOX CULVERT	SW CORNER NICHOLS/BROADWAY	RESIDENTIAL
2@12' X 4' BOX CULVERT	S SIDE OF CHESTNUT EXPY, E OF FRANKLIN	RESIDENTIAL, COMMERCIAL
2@6' x 4' BOX CULVERT	JORDAN CREEK WEST OF GRANT AVENUE VIADUCT	INDUSTRIAL, COMMERCIAL
2@6' X 3' BOX CULVERT	319 N MAIN AV (FROM S INTO CREEK UNDER BUILDING)	INDUSTRIAL, COMMERCIAL
48" RCP	JORDAN CREEK AT BENTON VIADUCT (FROM 2 INTO CREEK)	INDUSTRIAL, COMMERCIAL
3.5' X 5.5' BOX CULVERT	JORDAN CREEK AT JEFFERSON AV (FROM S INTO CREEK)	INDUSTRIAL, COMMERCIAL
9' X 4' BOX CULVERT	JORDAN CREEK AT MAIN AV (FROM N UNDER MAIN)	INDUSTRIAL, COMMERCIAL
	JORDAN CREEK NORTH BRANCH WATERSHED	
36" RCP	NE CORNER CLAY/CENTRAL	COMMERCIAL, RESIDENTIAL
4.5' X 3' BOX CULVERT	JORDAN NB UNDER PROSPECT AV	RESIDENTIAL, COMMERCIAL
4' X 3.5' BOX CULVERT	JORDAN NB UNDER FREMONT AV	RESIDENTIAL, COMMERCIAL
43" X 27" CMP	S OF BLAINE AT NIAS	INDUSTRIAL, COMMERCIAL
6' X 2' BOX CULVERT	BLAINE/YATES (FROM N INTO CREEK)	RESIDENTIAL
	JORDAN CREEK SOUTH BRANCH WATERSHED	
42" RCP	JORDAN SB WEST OF NATIONAL AV (FROM N INTO CREEK)	COMMERCIAL
36" RCP	JORDAN SB UNDER NATIONAL AV (FROM N INTO CREEK)	COMMERCIAL
42" RCP	JORDAN SB UNDER NATIONAL AV (FROM S INTO CREEK)	COMMERCIAL
4' x 4' BOX CULVERT	N OF 1500 BLOCK W TRAFFICWAY(FROM S TO RR CHANNEL)	COMMERCIAL
4' X 6' BOX CULVERT	1630 E CHESTNUT EXPY	COMMERCIAL
3.5' X 3' BOX CULVERT	JORDAN SB UNDER GLENSTONE VIADUCT	COMMERCIAL
	PEA RIDGE CREEK WATERSHED	

6' x 4' BOX CULVERT	600 BLOCK E TURNER ST	RESIDENTIAL
2' X 2' BOX CULVERT	2244 N BOLIVAR RD	RESIDENTIAL, COMMERCIAL
6' X 4.5' BOX CULVERT	2244 N BOLIVAR RD	RESIDENTIAL, COMMERCIAL
5' X 3' BOX CULVERT	2244 N BOLIVAR RD	RESIDENTIAL
WARD BRANCH WATERSHED		
38" X 60" HECP	1062 E PENDLETON PL	RESIDENTIAL
2 @ 7' X 3' BOX CULVERT	1200 BLK E BRADFORD PKWY	COMMERCIAL
42" RCP	1465 E PRIMROSE ST	COMMERCIAL
60" RCP	1465 E PRIMROSE ST	RESIDENTIAL
2 @ 30" RCP	E SIDE 1630 E BRADFORD PKWY	COMMERCIAL
42" RCP	3700 BLK S WELLER	COMMERCIAL
36" RCP	3801 S NATIONAL AVE	COMMERCIAL
72" RCP	SW CORNER 3801 S NATIONAL AVE	COMMERCIAL
2 @ 72" RCP	1035 E REPUBLIC RD	COMMERCIAL
36" RCP	4109 S NATIONAL AVE	COMMERCIAL
WILSONS CREEK WATERSHED		
6' x 2.5' BOX CULVERT	1100 BLOCK S HILLCREST (FROM N INTO E-W CHANNEL)	RESIDENTIAL

*Major outfalls are identified as mapping of the MS4 progresses.

SOUTHWEST WASTEWATER PLANT LABORATORY
SPRINGFIELD, MISSOURI
PESTICIDE DATA ANALYSIS

SAMPLE NUMBER:
SAMPLE NAME:

SAMPLE DATE:See 2002-2003, 2003-2004, and 2004-2005 sample dates
SAMPLE TYPE: GRAB
SAMPLE CODE: SE
SUBMITTED BY:

ORGANIC COMMENTS:

PESTICIDE EPA METHOD: 624
PESTICIDE CONC UNITS: UG/L

COMPOUND		COMPOUND	
ALDRIN	<0.005	ENDRIN	<0.005
ALPHA-BHC	<0.005	ENDRIN ALDEHYDE	<0.005
BETA-BHC	<0.005	HEPTACHLOR	<0.005
GAMMA-BHC (LINDANE)	<0.005	HEPTACHLOR EPOXIDE	<0.005
DELTA-BHC	<0.005	PCB-1242	<20
CHLORDANE	<0.010	PCB-1254	<20
4,4-DDT	<0.005	PCB-1221	<10
4,4-DDE	<0.005	PCB-1232	<10
4,4-DDD	<0.005	PCB-1248	<20
DIELDRIN	<0.005	PCB-1260	<20
ALPHA-ENDOSULFAN	<0.005	PCB-1016	<20
BETA-ENDOSULFAN	<0.005	TOXAPHENE	<0.025
ENDOSULFAN SULFATE	<0.005		

NR = NOT RUN

SOUTHWEST WASTEWATER PLANT LABORATORY
SPRINGFIELD, MISSOURI
ACID/BASE NEUTRAL ORGANIC ANALYSIS

SAMPLE NUMBER
SAMPLE NAME:
SAMPLE DATE: See 2002-2003, 2003-2004, and 2004-2005 sample dates
SAMPLE TYPE: GRAB
SAMPLE CODE: SE
SUBMITTED BY:

ORGANIC COMMENTS:

B/NEPA METHOD 625 **B/NCONC UNITS** UG/L **ACIDS EPA METHOD** 625 **ACIDS CONC UNITS** UG/L

BASE NEUTRAL ORGANIC COMPOUNDS

N-NITROSODIMETHYLAMINE	<l0
BIS(2-CHLOROETHYL) ETHER	<10
1.3-DICHLOROBENZENE	<l0
1.4-DICHLOROBENZENE (BN)	<10
1,2-DICHLOROBENZENE (BN)	<10
BIS 2-CHLOROISOPROPYLE ETHER	<10
HEXACHLOROETHANE	<10
N-NITROSODI-N-PROPYLAMINE	<10
NITROBENZENE	<10
ISOPHORONE	<10
BIS 2-CHLOROETHOXY METHANE	<10
1,2,4-TRICHLOROBENZENE	<10
NAPHTHALENE	<10
HEXACHLOROBUTADIENE	<10
HEXACHLOROCYCLOPENTADIENE	<10
2-CHLORONAPHTHALENE	<10
DIMETHYLPHTHALATE	<10
ACENAPHTHYLENE	<10
2,6-DINITROTOLUENE	<10
ACENAPHTHENE	<10
2,4-DINITROTOLUENE	<10
DIETHYLPHTHALATE	<l0
FLUORENE	<l0
4-CHLOROPHENYL PHENYL ETHER	<10
N-NITROSODIPHENYLAMINE	<10
1,2-DIPHENYLHYDRAZINE	<10
4-BROMOPHENYL PHENYL ETHER	<l0
HEXACHLOROBENZENE	<10
PHENANTHRENE	<10
ANTHRACENE	<10

BASE NEUTRAL ORGANIC COMPOUNDS

DI-N-BUTYLPHTHALATE	<l0
FLUORANTHENE	<10
BENZIDINE	<10
PYRENE	<l0
BUTYLBENZYLPHTHALATE	<10
BENZO(A) ANTHRACENE	<l0
3,3-DICHLOROBENZIDINE	<l0
CHRYSENE	<10
B1S(2-ETHYLHEXYL) PHTHALATE	<10
DI-N-OXTYLPHTHALATE	<l0
BENZO(B) FLUORANTHENE	<10
BENZO(K) FLUORANTHENE	<l0
BENZO(A) PYRENE	<10
INDENO(1,2,3-C,D) PYRENE	< 10
DIBENZO(A,H) ANTHRACENE	<10
BENZO(B,H,I) PERYLENE	<10
2,3,7,8 TCDD (DIOXIN)	< 10
BROMOMETHOXYNAPHTHALENE	<10

ACID ORGANIC COMPOUNDS

PHENOL	<10
2-CHLOROPHENOL	<10
2-NITROPHENOL	<20
2,4-DIMETHYLPHENOL	<10
2,4-DICHLOROPHENOL	<l0
P-CHLORO-M-CRESOL	<10
2,4,6-TRICHLOROPHENOL	<10
2,4-DINITROPHENOL	<25
4,6-DINITRO-O-CRESOL	<25
PENTACHLOROPHENOL	<25
4-NITROPHENOL	<25

nR = NOT RUN

SOUTHWEST WASTEWATER PLANT LABORATORY
SPRINGFIELD, MISSOURI
VOLATILE ORGANIC ANALYSIS

SAMPLE NUMBER:
SAMPLE NAME:
SAMPLE DATE:See 2002-2003, 2003-2004, and 2004-2005 sample dates
SAMPLE TYPE: GRAB
SAMPLE CODE: SE
SUBMITTED BY:

ORGANIC COMMENTS:

VOLATILE EPA METHOD: 624
VOLATILE CONC UNITS: UG/L

COMPOUND		COMPOUND	
CHLOROMETHANE:	<10	TRANS 1,3-DICHLOROPROPENE:	<1
VINYL CHLORIDE:	<10	TRICHLOROETHYLENE:	<1
CHLOROETHANE:	<10	BENZENE:	<5
BROMOMETHANE:	<10	CIS 1,3-DICHLOROPROPENE:	<1
ACROLEIN:	<12	1,1,2-TRICHLOROETHANE:	<1
ACRYLONITRILE:	<22	DIBROMOCHLOROMETHANE:	<1
METHYLENE CHLORIDE:	<5	BROMOFORM:	<1
TRICHLOROFLUOROMETHANE:	<10	1,1,2,2-TETRACHLOROETHYLENE:	<1
1,1-DICHLOROETHYLENE:	<1	1,1,2,2-TETRACHLOROETHANE:	<1
1.1-DICHLOROETHANE:	<1	TOLUENE:	<5
TRANS1.2-DICHLOROETHYLENE:	<1	CHLOROBEN2ENE:	<5
CHLOROFORM:	<1	ETHYLBENZENE:	<5
1.2-DICHLOROETHANE:	<1	2-CHLOROETHYL VINYL ETHER:	<10
1,1,1-TRICHLOROETHANE:	<1	DICHLORODIFLUOROMETHANE:	<10
CARBON TETRACHLORIDE:	<1	BIS(CHLOROMETHYL) ETHER:	<10
BROMODICHLOROMETHANE:	<1	XYLENE:	<10
1,2-DICHLOROPROPANE:	<1		

NR = NOT RUN

A Final Report to the City of Springfield on the Biological Assessment of Urban Streams

Missouri State University
Conducted by:
Dr. Daniel W. Beckman and Michael R. Kromrey
July 1, 2004 – December 1, 2005

Table of Contents

List of Figures

List of Appendices

Note: The appendices were included in the hard copy of the report but are not included in this report file. Reference information has been added after each appendix listing. The appendices are documents and sections of documents that can be accessed using the reference information and Literature Cited on page 13.

Abstract

This study assessed the health of three biotic communities in Jordan and Galloway Creeks in Springfield, Missouri. Fish, benthic macroinvertebrates and periphyton samples were collected from each stream using the U.S. Environmental Protection Agency's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers,* hereinafter referred to as the RBPs. Samples were collected in September 2004 and February 2005, and organisms were identified and counted. The numbers of organisms and taxa present were evaluated with regionally modified metrics to extrapolate an Index of Biotic Integrity (IBI). Results suggest that the biotic communities are impaired in both streams, with Jordan Creek more severely impaired than Galloway Creek.

Introduction

Plants and animals in urban streams receive a barrage of stressors that challenge the health of the ecosystem. The subjects of this study, Galloway Creek and Jordan Creek, are no exception. With growth and urbanization of the Springfield area, the amount of impervious surfaces, such as roads, parking lots, and rooftops has increased. These changes in the watershed increase runoff volume and rate, which increases the physical disturbance resulting from rain events. The streams also undoubtedly receive more organic and inorganic pollutants from point and non-point sources than they would in their natural state. Still, many organisms in Jordan and Galloway Creeks survive and flourish despite the anthropomorphic stressors in their environment.

The organisms that live in a stream can tell us about the health of the stream. Biological communities reflect overall ecological integrity (i.e., chemical, physical, and biological integrity), integrate the effects of different stressors providing a broad measure of impact, and integrate stresses over time (Barbour 1999). One tool used to explain and quantify the health of a stream by the biota present is the Index of Biotic Integrity (IBI). The IBI was developed by Dr. James Karr and is based on categories, or metrics, and adapted for different ecoregions. Metrics reflect aspects of the community such as diversity, sensitive species richness, and percent tolerant individuals. The end result of calculating the metrics is a score similar to a report card; the number calculated signifies the level of impairment in comparison to a reference condition.

Each community - fish, benthic macroinvertebrates, and periphyton—has different advantages when conducting a biosurvey. The advantages, according to the RBPs, are attached in Appendix A. For this study, the fish and benthic macroinvertebrate communities

were sampled to evaluate ecological integrity with established, regionally modified IBI's, and a periphyton survey was conducted for baseline data.

Methods

The sample sites were selected by the City of Springfield and modified slightly to escape possible impacts of bridge crossings (Keener 2003). The Jordan Creek sample site was located above the Bennett St. crossing, and the Galloway Creek site was located above the James River Freeway crossing. The downstream end of each site started at least 100 meters upstream of the bridges because it has been shown that bridge crossings may affect the communities and IBI outcomes. Each sample site was 100m long and included all habitat types. The same site was used for the fish, benthic macroinvertebrate, and periphyton sampling.

Fish

Fish were collected according to the protocol that the Missouri Department of Conservation (MDC) developed for the statewide bioassessment initiative (modified from the RBPs). Both sites were sampled on August 27, 2004, and again on February 17, 2005. The sampling was carried out by isolating the 100m sample site and electrofishing using two Smith-Root backpack electrofisher units. A team of four to six individuals started at the downstream end of the site and worked upstream. Every fish over two centimeters in length was identified and counted streamside. See Appendix C for the protocol.

Periphyton

Periphyton sampling was conducted according to the RBPs, included in Appendix B. Using the multihabitat approach, the size of the periphyton site is suggested to be 30 to 40 stream widths. Periphyton was collected from all available substrates in approximate proportion to the frequency of the substrate type. Each individual sample was added to a common container to form the composite sample. Ten individual samples formed the

composite sample. The composite samples from each creek were preserved with Lugol's Iodine. Sub-samples were taken from the composite sample and fixed onto permanent slides.

An attempt was made to sample periphyton biomass also. The details of the technique are found in steps 1-6 of the RBPs in Appendix B**.** The sampling consisted of selecting transects, and using a grid to quantify algal biomass at points along each transect.

Benthic Macroinvertebrates

Benthic macroinvertebrates were sampled according to the RBPs for multihabitats. This approach is designed for a 100m stretch with representative habitats. A sketched map of the stretch of stream was made, indicating habitat types. The collection was taken with a D-frame dip net. Lotic samples were taken with the net in a fixed position and a square meter upstream of the net disturbed 10 centimeters deep where possible. Lentic samples were taken by disturbing a meter squared circle with the net following the feet of the disturber. The amount of each habitat sampled was in approximate proportion to their representation. Ten, one meter square areas were sampled per site.

Samples were taken at both sites on September 7, 2004, and February 17, 2005. In the lab, insects were separated from the detritus and identified. No subsampling was done. All Ephemeroptera, Plecoptera, Odonata, and Trichopetra were identified to genus level, and other organisms such as Oligocheats, Hirundina, and Chironomids were identified to lowest possible level - often family. The specimens were preserved with 70% ethanol, labeled, and archived.

The primary metrics used to evaluate the benthic macroinvertebrate community were Taxa Richness (TR), Ephemeroptera/Plecoptera/Trichoptera Index (EPT), Biotic Index (BI), and Shannon Diversity Index (SDI). These metrics are suggested by the Missouri

Department of Natural Resources (MDNR) protocol titled *Semi-Quantitative Macroinvertebrate Stream Bioassessment*. Taxa richness is the number of individual taxa represented (usually identified to genus level). The taxa richness should increase with improving water quality. The EPT index is the number of genera belonging to the EPT orders, or more simply, the genera of Mayflies, Stoneflies, and Caddisflies present in each sample. The BI is basically a regionally modified Hilsenhoff Biotic Index, where each taxa has an assigned tolerance value. The higher the BI score, the more tolerant/less healthy the community is. It should be noted that the BI values used for Hirundinea, Oligocheata, Amphipoda, and Simuliidae are an average of the values from their respective groups. Finally, the SDI is a measure of community composition that takes into account both richness and evenness. "It is assumed that a more diverse community is a more healthy community; diversity increases as the number of taxa increase, and as the distribution of individuals among those taxa is more evenly distributed." (Sarver 2001).

These four primary metrics are used to calculate an index of biotic integrity called the Stream Condition Index (SCI). The SCI is calculated by MDNR for the spring and fall of each year from several reference streams. The metric scores in this study were compared to MDNR's reference scores from this ecoregion (Ozark White River drainage). The result is a single percentage: if the study stream scores 100%-80% of the reference biological criteria it is considered supporting, 70%-50% partially supporting, and 40%--20% non-supporting (Sarver 2001). It is important to note that since the EPA protocol was used in sampling macroinvertebrates in this study, not the MDNR protocol, the data collected may not be directly comparable to the regional reference data.

Results and Discussion

Physical Description

Galloway Creek and Jordan Creek exhibit symptoms of urban impacts upon observation. Litter is prevalent at both sites. At higher flows, aromas of hydrocarbons can be detected. The watersheds of the two creeks are somewhat different.

Galloway Creek flows from Sequiota Cave and has a vegetated buffer for most of its length. The upper 2/3 of the creek is buffered by the Ozark Greenways trail, and the lower 1/3 is located in the Springfield Nature Center. The only major industry adjacent to the creek is a limestone quarry. Two profound impacts have occurred in the history of Galloway Creek. First, the damming of the James River to form Lake Springfield isolated Galloway Creek from the flowing waters of the James. Second, in the late sixties and early seventies, Galloway received large inputs of septic effluent because many homes used onsite sewage treatment in the karst recharge area of Sequiota Spring. Fortunately, the recharge area is now part of the urban service boundary and the majority of the area has been put on city sewer with the remainder scheduled for sewering in the next few years.

Jordan Creek has a larger watershed than Galloway, and is more urbanized. Jordan flows through downtown Springfield where industrial activity has occurred for more than a hundred years. Much of the stream has been channelized and tunneled underground. Jordan is more prone to flash flooding and scour than Galloway. Visible evidence of bank erosion and channel erosion are evident within the Jordan Creek sample site. The sample site is also surrounded by two solid waste companies, one being the major solid waste transfer station, a chemical company, and a railway.

Fish

Samples yielded from 163 to 696 individual fish. Jordan Creek yielded roughly twice as many fish as Galloway on each date. The numbers of individuals collected for each species are listed in Figures 1 and 2. These numbers were used to calculate the metric values according to MDC's fish sampling protocol. The equations for each metric can be found in Appendix C.

The scores for each metric and an overall IBI for the samples are listed in Figures 3 and 4. For fish samples, Jordan Creek scored an IBI of 66.63 in the fall and 66.32 in the spring. Galloway Creek scored an IBI of 76.78 in the fall and 80.01 in the spring. The IBI of Jordan Creek changed less than 1 percent from the fall to the spring sample, and Galloway creek changed slightly over 3 percent. All of the IBI scores fall into the *moderately impaired* category, except the spring Galloway Creek sample which was border-line *minimally impaired* (80—100 = minimally impaired, 60—79.99 = moderately impaired, below 60 = severely impaired).

In terms of fish community structure, moderately impaired generally means: "Most if not all sensitive fishes are absent. The trophic structure is highly skewed towards omnivores, herbivores, and tolerant species." The lowest metric scores for Jordan Creek were sensitive species richness and percent invertivores. The lowest metric scores for Galloway Creek were percent water column species, sensitive species richness, and percent invertivores. Although the benthic species richness metric for Jordan Creek was not particularly low, there was a notable lack of any darter species.

Benthic Macroinvertebrates

Each site yielded several taxa of benthic macroinvertebrates. The taxa sampled and number of individuals in each taxa are presented in Figures 9 -12. In order to better understand these figures, Figure 5 compares common names and scientific names. In Figure 5, Ephemeroptera, Plecoptera, and Tricoptera are highlighted because the EPT index in Figure 6 refers to these three orders. The order Plecoptera (stoneflies) did not appear in any sample; this is notable because stoneflies are a relatively pollution intolerant group.

Total numbers of benthic macroinvertebrates collected ranged from approximately 800-900 with the exception of the February sample of Jordan Creek, in which only 106 total individuals were captured (see Figure 8). It is the opinion of this study that the drastic plunge in the number of benthic macroinvertebrates in the spring sample from Jordan Creek, and the increase in the Biotic Index value, were due to flooding that severely scoured the channel.

Figure 6 is a summary of the primary metrics for the macroinvertebrate community. The most noteable aspect is the increase in the Jordan Creek BI from fall to spring that is discussed in the previous paragraph. Figure 7 shows how each sample scored with the Stream Condition Index (SCI) detailed in the MDNR protocol (Sarver 2001). The SCI scores indicate that Galloway Creek is only partially supporting at best and Jordan Creek is non-supporting.

Periphyton

Periphyton were identified to family level and photographed for baseline data. The taxa identified and photographed are shown in Figures 13-14. In the process of this study it became obvious that it was not possible to provide meaningful periphyton data beyond baseline inventory. It requires a great deal of expertise to identify periphyton to a taxonomic

level that could be useful in biotic integrity indices. Periphyton also reflect changes in a shorter timeframe than the sampling intervals in this study would detect - in other words, the periphyton community could crash, rebound, and crash again in the period of months between samples.

Discussion

The communities of fish and macroinvertebrates both lack sensitive species that streams of similar size in the area would probably contain. This is not surprising given the long period of urbanization in these watersheds. It would be interesting to know if the system could support sensitive species in its current state; it seems possible that the sensitive species may have been extirpated during some period in the creeks' histories and not repopulated, though current conditions might support them.

This study provides data to help gauge future changes in the stream. The data for Jordan Creek should be compared with the water quality study of Jordan Creek also conducted by Missouri State University for the City of Springfield during the time period of this study. It is the opinion of this study that the most obvious and dramatic impact on the communities in Jordan Creek is the scouring/flash flooding that occurs rather frequently. The circumstantial evidence that leads to this opinion is the dramatic decrease in macroinvertebrate numbers from the fall to the spring, and the physical changes and sign of scour that occurred during the monitoring period. Our urban streams are a long neglected resource, and the City of Springfield is commended for funding this study as a crucial step to improving the health of these streams.

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Figure 1) Species of Fish from Jordan Creek Electrofishing Sample

Jordan Creek		**Number of Individuals**	
Species		***8/27/2004***	***2/18/2005***
Largescale/Central Stoneroller		172	427
Duskystripe Shiner		11	9
Southern Redbelly Dace		147	99
Creek Chub		63	91
White Sucker		5	14
Yellow Bullhead		18	7
Blackspotted Topminnow		5	5
Banded Sculpin		5	3
Bluegill		5	8
Green Sunfish		13	32
Green Sunfish X Bluegill		0	0
Mosquito Fish		2	1
	Total	446	696

Figure 2) Species of Fish from Galloway Creek Electrofishing Sample

Galloway Creek		**Number of individuals**	
Species		***8/27/2004***	***2/18/2005***
Largescale/Central Stoneroller		0	18
Ozark Minnow		0	19
Yellow Bullhead		1	0
Largemouth Bass		8	0
Bluntnose Minnow		0	19
Creek Chub		5	4
Blackspotted Topminnow		13	62
Bluegill		89	28
Longear Sunfish		23	19
Green Sunfish		15	46
Green Sunfish X Bluegill		0	0
Orangethroat Darter		5	27
Greenside Darter		1	0
Rainbow Darter		0	3
Logperch		3	1
	Total	163	246

Figure 3) Jordan and Galloway Creek Metric Scores for 9/10/04

Fish Sample One 8/27/04		
Metric (10 points possible; 10=best/healthiest)	**Jordan**	**Galloway**
Native Species Richness	6.20	6.68
Native Family Richness	10.00	9.73
Number of Individuals	10.00	10.00
Sensitive Species Richness	1.97	5.67
Percent Tolerant Individuals	7.85	8.71
Native Benthic Species	8.05	7.72
Water Column Species	4.24	4.08
Long-Lived Species	8.24	10.00
Percent Introduced Species	10.00	10.00
Percent Carnivores (individuals)	8.52	8.59
Percent Invertivores (individuals)	1.03	5.52
Percent Omnivores and Herbivores	3.86	5.43
(MetricScore/120)x100	**66.63%** **Moderately Impaired**	**76.78%** **Moderately Impaired**

Figure 4) Jordan and Galloway Creek Metric Scores for 2/18/05

Fish Sample Two 2/18/05		
Metric (10 points possible; 10=best/healthiest)	**Jordan**	**Galloway**
Native Species Richness	6.15	7.26
Native Family Richness	10.00	7.69
Number of Individuals	10.00	10.00
Sensitive Species Richness	1.94	2.75
Percent Tolerant Individuals	8.12	7.20
Native Benthic Species	7.97	10.00
Water Column Species	4.16	3.96
Long-Lived Species	8.12	9.26
Percent Introduced Species	10.00	10.00
Percent Carnivores (individuals)	8.84	10.00
Percent Invertivores (individuals)	0.52	9.11
Percent Omnivores and Herbivores	3.76	8.79
(MetricScore/120)x100	**66.32%** **Moderately Impaired**	**80.01%** **Minimally Impaired**

Figure 5) Scientific/Common Name Comparison for Benthic Macroinvertebrates

Scientific Names	**Common Names**
Oligocheata	Aquatic Worms
Hirundinea	Leeches
Coleoptera	Beetles
Decapoda	Crayfish
Diptera	Flies
Ephemeroptera	***Mayflies***
Plecoptera	***Stoneflies***
Tricoptera	***Caddisflies***
Hemiptera	True Bugs
Amphipoda	Scuds
Isopoda	Sow Bugs
Molluska	Mollusks (Clams, Snails, etc)
Platyhelmenthes	Planarians
Nematomorpha	Horsehair worms

Figure 6) Summary of Primary Metrics of Benthic Macroinvertebrate Data

Location	**Date**	**Taxa Richness**	**EPT Index**	**Biotic Index**	**Shannon-Weaver Diversity Index**
Jordan	9/10/2004	18	4	6.77	1.9111
Jordan	2/17/2005	15	3	8.19	1.7899
Galloway	9/10/2004	22	7	4.25	2.0397
Galloway	2/17/2005	19	7	6.39	2.186

Figure 7) Summary of Macroinvertebrate Stream Condition Index Scores

Location	**Date**	**Score**	**Interpretation**
Jordan	9/10/2004	40%	Non-supporting
Jordan	2/17/2005	30%	Non-supporting
Galloway	9/10/2004	50%	Partially supporting
Galloway	2/17/2005	40%	Non-supporting

Figure 8) Total Number of Macroinvertebrates in Each Sample

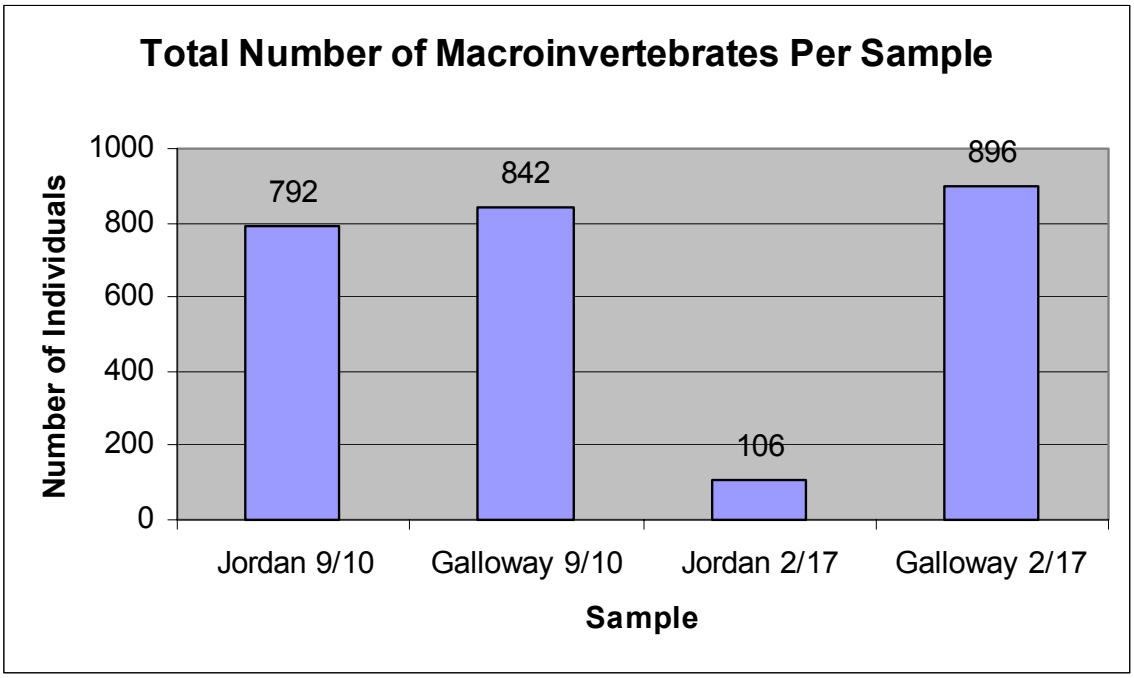


Figure 9) Benthic Macroinvertebrate Taxa of Jordan Creek 9/10/04

9/10/04 Jordan Creek Macroinvertebrate Taxa

Order	Class	Family	Genus/Species	Total	*BIV
Coleoptera		Elmidae	Stenelmis	175	5.4
		Elmidae	Dubiraphia	1	6.4
Odonata	Zygoptera	Calopterygidae	Calopteryx	14	8.3
	Zygoptera	Coenagrionidae	Argia	7	8.7
	Zygoptera	Coenagrionidae	Chromagrion	6	x
	Zygoptera	Coenagrionidae	Amphiagrion	4	2.8
	Zygoptera	Coenagrionidae	Enallagma	7	9
Tricoptera		Hydropsychidae	Cheumatopsyche	3	6.6
Ephemeroptera		Heptageniidae	Stenonema	17	3.4
		Caenidae	Caenis	91	7.6
		Baetidae	Paracloeodes	100	5
Crustacea		Orconectes		1	2.7
Diptera	Chironomids		3 Taxa	205	x
	Tipulidae			1	x
Annelida	Oligocheata			150	9.2
	Hirundinea			10	7.4

*Biotic Index Value

Total Individuals **792**

Figure 10) Benthic Macroinvertebrate Taxa of Galloway Creek 9/10/04

9/10/04 Galloway Creek Macroinvertebrate Taxa

Order	Class	Family	Genus		Total	*BIV
Coleoptera		Psephenidae	Psephenus herricki		320	2.5
		Elmidae	Stenelmis	*larvae*	115	5.4
		Elmidae	Stenelmis	*adult*	3	5.4
		Elmidae	Dubiraphia	*larvae*	3	6.4
Odonata	Zygoptera	Calopterygidae	Calpoteryx		8	8.3
		Coenagrionidae	Agria		28	8.7
		Coenagrionidae	Amphiagrion		9	2.8
Tricoptera		Hydropsychidae	Cheumatopsyche		8	6.6
		Polycentropodidae	Polycentropus		4	3.5
		Philoptamiidae	Chimarra		7	2.8
Hemiptera		Velidae	Rhagovelia		2	7.3
Ephemeroptera		Baetidae	Paracleodes		52	5
		Caenidae	Caenis		4	7.6
		Heptageniidae	Stenacron		69	7.1
		Heptageniidae	Stenonema		86	3.4
Crustacea		Orconectes			3	2.7
Molluska		Corbicula			4	6.3
Annelida	Oligocheata				14	9.2
	Hirundinea				5	7.4
Diptera	Chironomids		3 Taxa		101	x
*Biotic Index Value			**Total Individuals**		**842**	

Figure 11) Benthic Macroinvertebrate Taxa of Jordan Creek 2/17/05

2/17/05 Jordan Creek Macroinvertebrate Taxa

Order	**Class**	**Family**	**Genus/Species**	**Total**	***BIV**
Coleoptera		Hydrophilidae	Tropisternus	1	9.8
Odonata	Zygoptera	Calopterygidae	Calopteryx	2	8.3
	Zygoptera	Coenagrionidae	Argia	2	8.7
	Zygoptera	Coenagrionidae	Amphiagrion	3	2.8
	Zygoptera	Coenagrionidae	Isuchnuria	1	9.4
Ephemeroptera		Heptageniidae	Stenonema	1	3.4
		Caenidae	Caenis	3	7.6
		Baetidae	Sp.	4	5
Decapoda		Orconectes		3	2.7
Molluska		Corbicula		2	6.3
Platyhelminthes	Tricladida	Planariidae		5	7.5
Diptera	Chironomids			25	x
Amphipoda				4	7.6
Annelida	Oligocheata			50	9.2
	Hirundinea			1	7.4
*Biotic Index Value			**Total Individuals**	**106**	

Figure 12) Benthic Macroinvertebrate Taxa of Galloway Creek 2/17/04

2/17/05 Galloway Creek Macroinvertebrate Taxa

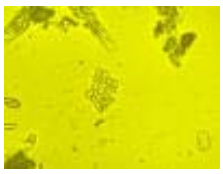
Order	**Class**	**Family**	**Genus**	**Total**	***BIV**
Coleoptera		Psephenidae	Psephenus	22	2.5
		Elmidae	Stenelmis larvae	128	5.4
		Elmidae	Stenelmis adult	2	5.4
	Zygoptera	Calopterygidae	Calpoteryx	1	8.3
Odonata		Coenagrionidae	Amphiagrion	3	2.8
Trichoptera		Hydropsychidae	Cheumatopsyche	14	6.6
		Hydropsychidae	Ceratopsyche	1	1.4
		Leptoceridae	Oecetis	4	5.7
		Philoptamiidae	Chimarra	19	2.8
Ephemeroptera		Baetidae	Fallceon?	176	6
		Heptageniidae	Stenacron	105	7.1
		Heptageniidae	Stenonema	25	3.4
Decapoda		Orconectes		5	2.7
Platyhelminthes	Tricladida	Planariidae		47	7.5
Nematomorpha				1	5
Diptera	Chironomids	**		196	x
	Simuliidae			1	4
Annelida	Oligocheata			101	9.2
Amphipoda				45	7.6

*Biotic Index Value

Total Individuals **896**

Figure 13) Periphyton Diversity of Jordan Creek


synedra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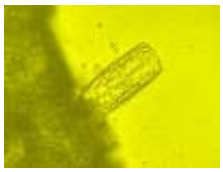
ulothrix


diatoma


navicula


cymbella


melosira


cladophora


fragilaria


cocconeis

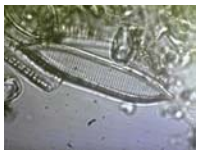

oedogonium


gomphomorpha

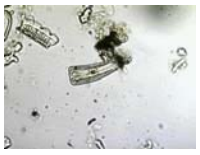

scenedesmus

Figure 14) Periphyton Diversity of Galloway Creek


coccineus


suriella


nitzschia


rhiocosphenia


navicula (1)


coccineis


cymatoplerua


rhiocosphenia

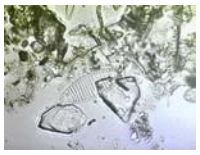

fragilaria


campylodiscus


cymbella


navicula (2)


diatoma (1)


diatoma (2)


diatoma (3)


gyrosigma